Bag Closing Apparatus

The invention relates to an apparatus for closing bags using plastic closures that are individually separable one after another from a closure strip being conveyed in a feeding channel, said closures having a plate-like shape and being linked to one another by means of connecting tabs, wherein the closures are slid with an opening having a slit on one side onto the neck of a bag by means of a shaped stamp having a holder for receiving the closure, said neck having been gathered into a ruche using gathering means.

It is known to close bags using plate-like closures that have a centrical opening and a slit, by means of a variety of closing apparatuses.

EP 1 075 422 describes a bag closing apparatus using closures that can be torn off individually one after another from a strip of closures, said closures being placed by means of a shaped stamp onto a bag neck that is gathered into a ruche.

It has been found that this system has the shortcoming that the process of tearing individual closures off the feeding closure strip is problematic in the case of higher throughput speeds. An incorrect positioning of the closures can occur in the shaped stamp, so that the process of sliding the closures onto the neck of the bag that has been gathered into a ruche results in a tearing or imprecise closing of the neck of the bag caused by an offset positioning of the closure.

It is an additional shortcoming that the closures may become jammed in the closing apparatus and

frequent uneconomical stoppages of the entire line occur at the required high throughput speeds.

It is the object of the invention to create a closing apparatus for bags that permits a simple and accurate separation of the closures from the closure strip at higher speeds and a more economical closing of the bags than is permitted by the prior art, and that no longer has the above shortcomings and provides additional advantages.

This object is met in such a way that the shaped stamp has an associated separating stamp and that the feeding channel with the closure strip lies in a plane orthogonal to the plane of movement of the stamps.

The features of the subclaims represent advantageous improvements and embodiments of the invention.

To meet this object, the shaped stamp together with a separating stamp performs the separation of the closures from the closure strip, the feeding channel for the closure strip being disposed such that the plate plane of the closures extends horizontally. Disposed at the end of the outlet of the feeding channel for the closure strip are the separating stamp and the shaped stamp and located further downstream is an end stop for the closure being separated. This end stop, together with an opposed guide means on the feeding channel, also forms a guide means for the closure in the vertical direction.

The closures are linked to one another by connecting tabs, thereby forming a continuous closure strip in such a way that in the horizontal arrangement one connecting tab is located towards the front and an additional one is located towards the equipment body. The closure strip extends such that the

slits of the openings of the closures point away from the equipment stand, i.e., they are located towards the front.

The separating stamp incorporates a separating finger and the shaped stamp has a fork head incorporating preferably four fingers, two fingers of which are disposed in each case in opposed parallel vertical planes and form between them a groove in each case, in which the separated closure is received. The finger pairs of a vertical plane form a recess between them.

The separating stamp and the shaped stamp are disposed and guided in the closing apparatus in such a way that they perform longitudinal movements in the vertical direction independently from one another in such a way that they perform the process of separating the closure from the closure strip, a process of swiveling the partially separated closure, the process of receiving of the closure, and the process of sliding the closure onto the gathered neck of the bag.

The finger of the separating stamp is disposed under the leading connecting tab of the closure being separated, located next to it the finger of the front plane of the shaped stamp facing the feeding channel of the closure strip, so that this finger is positioned centered under the edge facing the closure strip of the closure being separated.

A closing process, also called closing sequence, starts with the closure strip being transported in the feeding channel until the closure to be separated is located in the space between the outlet of the feeding channel and the end stop.

A vertical upward movement of the separating stamp and shaped stamp effects a tearing-off of the leading connecting tab of the closure from the closure strip and simultaneous raising of the front

edge having the slit of the opening of the closure. The tearing-off of the leading connecting tab is performed by the finger of the separating stamp and by the pressure of the finger of the shaped stamp located next to it.

The separating stamp is then stopped in this position, the shaped stamp continues to move vertically upward in such a way that the closure is swiveled around the not-yet-separated rear connecting tab in such a way that the fingers of the front plane of the fork head of the shaped stamp push underneath the closure being separated. The rear edge of the closure being separated is advantageously first held in place by an end stop and the swiveling process of the closure being separated is supported. During the continued upward movement of the fork head, the closure being separated is swiveled by 90° with its plate plane from the horizontal into the vertical and received between the two finger pairs of the fork head inside the grooves. In the process, the rear connecting tab is torn off, the closure is now separated from the closure strip and is pushed during a continued upward movement of the shaped stamp with the fork head onto the gathered neck of the bag. The shaped stamp with the fork head is then lowered vertically, during which process the separating stamp is moved back as well.

The leading fingers of the fork head are advantageously longer by approximately two thirds than the rear fingers of the fork head. It is of particular advantage if the leading finger facing the closure strip is slightly longer than the finger located next to it in the same plane, as this permits a precise initial separation of the leading connecting tab.

If is of additional advantage that the fingers of the rear plane of the fork head each have a bezel facing the fingers of the front plane of the fork head, rendering the process of receiving the swiveled closure simple, particularly during the upward movement of the fork head.

The end stop for the rear edge of the closure being separated is located above the plane of the feeding channel, centered between the rear fingers of the fork head and disposed on the closing apparatus towards the equipment stand. In a particularly economic design it is formed by a cylinder head of a cylinder head screw. During the upward movement of the fork head the end stop is received by the recess between the rear fingers of the fork head and thus cannot impede the upward movement but advantageously participate in the swiveling of the closure.

The separating stamp and shaped stamp are disposed such that they and/or their fingers slide on each other or are spaced apart, thus resulting in an advantageous space-saving design.

It is possible to retrofit the inventive closing apparatus for packaging machines and it is also suitable for different gathering systems.

By using the separating stamp, a wide footprint of the shaped stamp and accordingly of the gathering means can be avoided, which would have the disadvantage that the bags would no longer be gathered as tightly and the product would not be packaged tightly enough.

Additional details of the invention will be explained with the aid of example embodiments in the drawings, in which:

Fig. 1 shows a perspective view of the bag closing apparatus with closed gathering means, closure-strip feeding channel, and separating stamp and shaped stamp without bag,

Fig. 2 shows a top view according to Figure 1 with bag neck and bag neck ruche,

Fig. 3 shows a closure in the top view onto its plate plane and its position on the ruche of the bag neck in a view from above,

Fig. 4 shows a front view of a closure-strip feeder with closure strip,

Fig. 5 shows a perspective view of a separating stamp and shaped stamp with closure strip and a closure partially separated from the same,

Fig. 6 shows a shaped stamp in a side view and top view,

Fig. 7-1 shows a front view and perspective view of the starting position of the closing sequence of the functional elements,

Fig. 7-2 shows a front view and perspective view of the first separation process in the closing sequence of the functional elements,

Fig. 7-3 shows a front view and perspective view of the swiveling process and second separation process in the closing sequence of the functional elements,

Fig. 7-4 shows a front view and perspective view of the end position of the closing sequence of the functional elements,

Fig. 8 shows a side view of an example packaging machine with integrated closing apparatus, and

Fig. 9 shows a top view according to Figure 8.

Bags 11 of plastic film with packaging content – articles 17 of all kinds, especially bread – are closed in their neck region in each case by means of plastic closures 2 that are individually separable one after another from a closure strip 18, said closures encompassing the bag neck 12 with an opening 16 that is opened on one side of its circumference by a slit 15. A closing apparatus 1 is provided for this purpose in which the neck 12 of the bag is gathered into a ruche 13 by means of known gathering means 3 and one closure 2 is slid in each case in the linear bag passage 24 and in the same plane onto the ruche 13 in an upward movement with its opening 16 that is provided with the slit 15. The linear bag passage 24 lies in the packaging direction 19 of a packaging machine 20.

During the closing process (see Fig. 2 and 3), the closure 2 and ruche 13 are located orthogonally or at an angle to one another in the linear bag passage 24, whereby, when the closure 2 is slid onto the ruche 13, the slit 15 of the opening 16 is being widened transversely to the closure 2 – to its plate plane – and the closure 2 thus slides on easily.

Forming of the ruche takes place in a known manner by means of two pivoting gathering means 3 that can be moved against each other, below which a feeding channel 25 that is oriented transversely to the bag passage 24 is disposed for the closure strip 18, as shown by Fig. 1.

An example embodiment of a feeding channel 25 with closure strip 18 is presented in Fig. 4 in a top view, with the arrow marking the direction of conveyance of the closure strip 18. The closures 2 are separably linked to one another by two connecting tabs 2a/2c and 2b/2d in each case. It is also possible to use closures 2 that are held together by short webs in lieu of the connecting tabs 2a-d. The feeding channel 25 is arranged such that the closure strip 18 extends horizontally with the plate plane of the closures 2, and the slits 15 of the openings 16 are located towards the front.

Adjoining the feeding channel is a stamp that is upwardly movable into the region of the gathering means 3 and separates one closure 2 in each case from the closure strip 18 and slides it onto the ruche 13, said stamp consisting of a separating stamp 4 and a shaped stamp 5. Disposed on the side opposite the outlet of the feeding channel 25 is an end stop 14 for the closure strip 18, so that the space between the outlet of the feeding channel 25 and the end stop 14 creates a space for only one closure 2. To adapt this space to the size of the given closure, the end stop 14 is adjustable. The end stop 14 has, at the same time, a guiding function for the closure 2 together with an opposed guide means 30 disposed on the feeding channel 25.

The separating stamp 4 and shaped stamp 5 are held vertically upwardly movable (see Fig. 5) in a linear guide means that is not shown and the feeding channel 25 for the closure strip 18 extends horizontally toward the stamps 4, 5, in such a way that the height adjustment plane of the stamps 4, 5 is disposed perpendicular to the plate plane of the closures 2.

Figure 5 represents the separating stamp 4 and shaped stamp 5 in connection with the closure strip 18 and an end stop 26; with the feeding channel 25, end stop 14, and gathering means 3 not shown in the illustration for ease of viewing.

The separating stamp 4 and shaped stamp 5 are disposed together vertically in a manner so that they can be moved against each other. They may slide on one another or they may be spaced apart. The separating stamp 4 has a finger 4a whose stamp surface is nearly parallel with the plate surface of the closures 2 of the closure strip 18. The finger 4a has the function to separate in each case the connecting tab 2a from the connecting tab 2c of the closure 2' still located in the feeding channel 25, for which purpose the finger 4a is located under the connecting tab 2a of the closure 2 being separated.

At the upper end of the shaped stamp 5, a fork head 6 is disposed that has four fingers 7, 8, 9, 9' , which are located in pairs in each case in two vertical planes located side by side, and which form in each case, between two fingers 7 and 9, as well as 8 and 9', grooves 10 to receive the closure 2, like it is shown in Fig. 6.

The fingers 7, 8 of the front plane of the fork head 6 project above the fingers 9, 9' of the rear plane by approximately two thirds of the length of the fingers 9, 9', in such a way that the length of the finger 7 facing the feeding channel 25 is slightly longer than that of the finger 8 disposed next to it. The fingers 9, 9' that are disposed behind them each have a bezel pointing towards the fingers 7, 8. The bezels permit an advantageous threading-in of the closure 2, which is received during the upward movement of the fork head 6 by the same in the grooves 10, in such a way that the plate plane of the closure 2 is located between the front plane and the rear plane of the fork head.

Disposed slightly above the plane of the feeding channel 25 on the vertical longitudinal axis of the rear plane of the fork head 6 is an end stop 26, which is advantageously a cylinder head screw. During the upward movement of the shaped stamp 5 with the fork head 6, the end stop 26 is received in a recess 6a between the fingers 9, 9' of the fork head 6. This can permit an additional guiding of the fork head 6.

During the separation of the connecting tab 2a of the closure 2 from the closure strip 18 in a first phase, which is performed by the separating stamp 4, the closure 2 is bent up with its front edge incorporating the slit 15 of the opening 16, and is supported with its rear edge under the end stop 26, so that a controlled swiveling of the closure takes place about the not-yet-separated connecting tab 2b. This process is supported by the fork head 6, which is also being moved upward, by a leading push of the longer finger 7 approximately under the center of the edge of the closure 2 facing the closure strip 18. Tests have shown that the longer length of the finger 7 is particularly advantageous for the controlled separating, swiveling and receiving of the closure 2 even at high closing speeds.

The continued upward movement of the shaped stamp 5 with the fork head 6 continues to swivel the closure 2 upward and, during the continued upward movement, separates the connecting tab 2b from the closure 2' held by the feeding channel, and receives in the grooves 10 the closure 2 that has been separated in this manner. The closure 2 is thus swiveled from the horizontal plane of the closure strip 18 by 90° into the vertical plane of the fork head 6, is now held with the fork head 6 and slid onto the ruche 13 in such a way that the lower edges of the grooves 10 exert the closing force onto the closure 2.

Figures 7-1 through 7-4 represent the closing sequence of the functional elements consisting of separating stamp 4, shaped stamp 5, fork head 6, end stops 14 and 26, and feeding channel 25 for closing a bag 11 by means of a closure 2, showing in each case a front view in the left half and a perspective view on the right half.

Fig. 7-1 shows the starting position of the separating stamp 4 and shaped stamp 5. The closure strip 18 has been pushed forward in the feeding channel 25 by means of known advancing means not shown in the illustration, during which process the closure 2 being separated has been pushed against the end stop 14.

Fig. 7-2 shows a first phase during which the separating stamp 4 is moved upward together with the shaped stamp 5 and separates the closure 2 at the connecting tab 2a from the closure strip 18, bending it up at its front edge.

The separating stamp remains in this position or returns into its starting position.

During a second phase, which is shown by Fig. 7-3, the closure 2 is swiveled up by the continued upward movement of the shaped stamp 5 by both fingers 7 and 8 about the connecting tab 2b, during which process the rear edge of the closure 2 is supported under the end stop 26 and the connecting tab 2b is separated from the closure strip 18 so that, as shown by Fig. 7-4 in a fourth phase, the closure 2 is received by the fork head 6 in the grooves 10 and slid onto the ruche 13 within the gathering means 3.

An example packaging machine 20 for articles 17, especially for bread, according to Fig. 8 and 9 has, in a equipment stand 21 a product conveyor table 23, preferably a conveyor belt with driving

features, for articles 17 lying behind one another, a bag feeder 28 with bags 11 feeding laterally to the packaging direction 19, two spreader plates 29 located in front of the bags 11 in the packaging direction, which individually open the bags 11, a pusher 27 that pushes the articles 17 from the conveyor table 23 into the opened bag 11, and behind it in the packaging direction 19 the bag closing apparatus 1, as well as an output belt 22 for the packaged articles 17, 11.

Each bag 11 is filled in the packaging machine 20 with the article 17, for example bread, and then moved with its bag neck 12 against the direction of conveyance, i.e., the packaging direction 19, toward the bag closing apparatus 1 in the linear bag passage 24 in the packaging direction 19 and in the same plane. There, the bag 11 is stopped. The gathering means 3 now gather the neck 12 of the bag into the ruche 13 (see Fig. 2).

The first closure 2 is used in each case for closing the neck 12 of the bag immediately after gathering of the ruche during the closing process as described above. After the closing process, the closure 2 encompasses the neck 12 of the bag and lies with its plate plane (transversely/orthogonally) to the direction of the linear bag passage 24 and vertically to the bag support being formed by the conveyor belt.

List of Reference Numerals

1	Closing apparatus
2, 2'	Closure
2a-d	Connecting tabs
3	Gathering means
4	Separating stamp
4a	Finger
5	Shaped stamp
6	Fork head
6a	Recess
7	Finger
8	Finger
9, 9'	Finger
10	Groove
11	Bag
12	Neck of bag
13	Ruche
14	End stop
15	Slit
16	Opening
17	Article
18	Closure strip
19	Packaging direction
20	Packaging machine
21	Equipment stand
22	Output conveyor belt
23	Product conveyor table
24	Linear bag passage
25	Feeding channel

26	End stop
27	Pusher
28	Bag feeder
29	Spreader plate
30	Guide means